What is claimed is:

[Claim 1]   1. An image rejection mixer comprising:

an in-phase mixer for mixing a received RF signal with an in-phase reference signal to produce a current mode in-phase mixed signal;

a quadrature-phase mixer for mixing the received RF signal with a quadrature-phase reference signal to produce a current mode quadrature-phase mixed signal, the quadrature-phase reference signal and the in-phase reference signal having a substantially orthogonal phase difference; and

a polyphase filter network having inputs receiving the current mode in-phase mixed signal and the current mode quadrature-phase mixed signal .

[Claim 2]   2. The image rejection mixer of claim 1, wherein the inputs of the polyphase filter network are directly connected to the outputs of the in-phase mixer and the quadrature-phase mixer.

[Claim 3]   3. The image rejection mixer of claim 1, further comprising an inductor coupled between an output of the polyphase filter network and a supply voltage to convert an output of the image rejection mixer to a voltage mode signal.

[Claim 4]   4. The image rejection mixer of claim 1, wherein the received RF signal, the in-phase reference signal, and the quadrature-phase reference signal are differential signals; the in-phase and quadrature-phase mixers are differential mixers; and the polyphase filter network has two differential inputs and one differential output.

[Claim 5]   5. The image rejection mixer of claim 4, further comprising a differential inductor coupled to the differential output of the polyphase filter network and having a center tap being coupled to a supply voltage to convert a differential output of the image rejection mixer to a differential voltage mode signal.

[Claim 6]   6. The image rejection mixer of claim 1, wherein the polyphase filter network is a single-stage polyphase filter network.

[Claim 7]   7. The image rejection mixer of claim 1, wherein the in-phase and quadrature-phase mixers are Gilbert mixers.

[Claim 8]   8. The image rejection mixer of claim 7, wherein the in-phase and quadrature-phase mixers are combined into one mixer unit having open drain outputs cascoded with the inputs of the polyphase filter network.

[Claim 9]   9. A method of mixing a received RF signal with a reference signal and removing an image signal component, the method comprising:

mixing the received RF signal with an in-phase reference signal to produce a current mode in-phase mixed signal;

mixing the received RF signal with a quadrature-phase reference signal to produce a current mode quadrature-phase mixed signal, the quadrature-phase reference signal and the in-phase reference signal having a substantially orthogonal phase difference; and

providing a polyphase filter network to receive the current mode in-phase mixed signal and the current mode quadrature-phase mixed signal, so as to generate a resultant IF signal;

wherein the image signal component is cancelled from the resultant IF signal.

[Claim 10] 10. The method of claim 9, wherein the inputs of the polyphase filter network are directly connected to the current mode in-phase mixed signal and the current mode quadrature-phase mixed signal.

[Claim 11] 11.The method of claim 9, further comprising converting an output signal of the polyphase filter network to a voltage mode signal using an inductor coupling the output signal of the polyphase filter network to a supply voltage.

[Claim 12] 12. The method of claim 9, wherein the received RF signal, the in-phase reference signal, the quadrature-phase reference signal, the in-phase mixed signal, and the quadrature-phase mixed signal are differential signals; and the polyphase filter network has two differential inputs and one differential output.

[Claim 13] 13. The method of claim 12, further comprising converting a differential output signal of the polyphase filter network to a differential voltage mode signal using a differential inductor coupled to the differential output of the polyphase filter network and having a center tap being coupled to a supply voltage.

[Claim 14] 14. The method of claim 9, wherein the polyphase filter network is a single-stage polyphase filter network.

[Claim 15] 15. The method of claim 9, further comprising:

providing an in-phase gilbert mixer used for mixing the received RF signal with the in-phase reference signal to produce the in-phase mixed signal; and

providing a quadrature-phase gilbert mixer used for mixing the received RF signal with the quadrature-phase reference signal to produce the quadrature-phase mixed signal.

[Claim 16] 16. The method of claim 15, wherein the in-phase and quadrature-phase gilbert mixers are combined into one mixer unit having open drain outputs cascoded with the inputs of the polyphase filter network.

[Claim 17] 17. An image rejection mixer comprising:

an in-phase mixer for mixing a received RF signal with an in-phase reference signal to produce an in-phase mixed signal at outputs of the in-phase mixer;

a quadrature-phase mixer for mixing the received RF signal with a quadrature-phase reference signal to produce a quadrature-phase mixed signal at outputs of the quadrature-phase mixer, the quadrature-phase reference signal and the in-phase reference signal substantially having a substantially orthogonal phase difference; and

a polyphase filter network having inputs receiving the in-phase mixed signal and the quadrature-phase mixed signal;

wherein the outputs of the in-phase mixer and the outputs of the quadrature-phase mixer are cascoded to the polyphase filter network.

[Claim 18] 18. The image rejection mixer of claim 17, wherein the inputs of the polyphase filter network are directly connected to the outputs of the in-phase mixer and the quadrature-phase mixer.